SEQUENCE LISTING

<110> Griffith, Irwin J et al.

<120> T CELL EPITOPES OF RYEGRASS POLLEN ALLERGEN

<130> IMI-040CP3

<140> 08/737,904
<141> 1996-11-20

<150> 08/106,016
<151> 1993-08-13

<160> 60

<170> PatentIn Ver. 2.0

<210> 1
<211> 1229
<212> DNA
<213> Escherichia coli

<220>
<221> CDS
<222> (40)..(942)

<400> 1

```
cgctatccct ccctcgtaca aacaaacgca agagcagca atg gcc gtc cag aag    54
                                          Met Ala Val Gln Lys
                                            1               5

tac acg gtg gct cta ttc ctc gcc gtg gcc ctc gtg gcg ggc ccg gcc   102
Tyr Thr Val Ala Leu Phe Leu Ala Val Ala Leu Val Ala Gly Pro Ala
                 10                  15                  20

gcc tcc tac gcc gct gac gcc ggc tac acc ccc gca gcc gcg gcc acc   150
Ala Ser Tyr Ala Ala Asp Ala Gly Tyr Thr Pro Ala Ala Ala Ala Thr
             25                  30                  35

ccg gct act cct gct gcc acc ccg gct gcg gct gga ggg aag gcg acg   198
Pro Ala Thr Pro Ala Ala Thr Pro Ala Ala Ala Gly Gly Lys Ala Thr
         40                  45                  50

acc gac gag cag aag ctg ctg gag gac gtc aac gct ggc ttc aag gca   246
Thr Asp Glu Gln Lys Leu Leu Glu Asp Val Asn Ala Gly Phe Lys Ala
     55                  60                  65

gcc gtg gcc gcc gct gcc aac gcc cct ccg gcg gac aag ttc aag atc   294
Ala Val Ala Ala Ala Ala Asn Ala Pro Pro Ala Asp Lys Phe Lys Ile
 70                  75                  80                  85

ttc gag gcc gcc ttc tcc gag tcc tcc aag ggc ctc ctc gcc acc tcc   342
Phe Glu Ala Ala Phe Ser Glu Ser Ser Lys Gly Leu Leu Ala Thr Ser
                 90                  95                 100

gcc gcc aag gca ccc ggc ctc atc ccc aag ctc gac acc gcc tac gac   390
```

```
Ala Ala Lys Ala Pro Gly Leu Ile Pro Lys Leu Asp Thr Ala Tyr Asp
            105                 110                 115

gtc gcc tac aag gcc gcc gag ggc gcc acc ccc gag gcc aag tac gac   438
Val Ala Tyr Lys Ala Ala Glu Gly Ala Thr Pro Glu Ala Lys Tyr Asp
        120                 125                 130

gcc ttc gtc act gcc ctc acc gaa gcg ctc cgc gtc atc gcc ggc gcc   486
Ala Phe Val Thr Ala Leu Thr Glu Ala Leu Arg Val Ile Ala Gly Ala
    135                 140                 145

ctc gag gtc cac gcc gtc aag ccc gcc acc gag gag gtc cct gct gct   534
Leu Glu Val His Ala Val Lys Pro Ala Thr Glu Glu Val Pro Ala Ala
150                 155                 160                 165

aag atc ccc acc ggt gag ctg cag atc gtt gac aag atc gat gct gcc   582
Lys Ile Pro Thr Gly Glu Leu Gln Ile Val Asp Lys Ile Asp Ala Ala
                170                 175                 180

ttc aag atc gca gcc acc gcc gcc aac gcc gcc ccc acc aac gat aag   630
Phe Lys Ile Ala Ala Thr Ala Ala Asn Ala Ala Pro Thr Asn Asp Lys
            185                 190                 195

ttc acc gtc ttc gag agt gcc ttc aac aag gcc ctc aat gag tgc acg   678
Phe Thr Val Phe Glu Ser Ala Phe Asn Lys Ala Leu Asn Glu Cys Thr
        200                 205                 210

ggc ggc gcc tat gag acc tac aag ttc atc ccc tcc ctc gag gcc gcg   726
Gly Gly Ala Tyr Glu Thr Tyr Lys Phe Ile Pro Ser Leu Glu Ala Ala
    215                 220                 225

gtc aag cag gcc tac gcc gcc acc gtc gcc gcc gcg ccc gag gtc aag   774
Val Lys Gln Ala Tyr Ala Ala Thr Val Ala Ala Ala Pro Glu Val Lys
230                 235                 240                 245

tac gcc gtc ttt gag gcc gcg ctg acc aag gcc atc acc gcc atg acc   822
Tyr Ala Val Phe Glu Ala Ala Leu Thr Lys Ala Ile Thr Ala Met Thr
                250                 255                 260

cag gca cag aag gcc ggc aaa ccc gct gcc gcc gct gcc aca ggc gcc   870
Gln Ala Gln Lys Ala Gly Lys Pro Ala Ala Ala Ala Ala Thr Gly Ala
            265                 270                 275

gca acc gtt gcc acc ggc gcc gca acc gcc gcc gcc ggt gct gcc acc   918
Ala Thr Val Ala Thr Gly Ala Ala Thr Ala Ala Ala Gly Ala Ala Thr
        280                 285                 290

gcc gct gct ggt ggc tac aaa gcc tgatcagctt gctaatatac tactgaacgt  972
Ala Ala Ala Gly Gly Tyr Lys Ala
    295                 300

atgtatgtgc atgatccggg cggcgagtgg ttttgttgat aattaatctt cgttttcgtt 1032

tcatgcagcc gcgatcgaga gggcttgcat gcttgtaata attcaatatt tttcatttct 1092

ttttgaatct gtaaatcccc atgacaagta gtgggatcaa gtcggcatgt atcaccgttg 1152
```

atgcgagttt aacgatgggg agtttatcaa agaatttatt attaaaaaaa aaaaaaaaaa 1212

aaaaaaaaaa aaaaaaa 1229

<210> 2
<211> 301
<212> PRT
<213> Escherichia coli

<400> 2

```
Met Ala Val Gln Lys Tyr Thr Val Ala Leu Phe Leu Ala Val Ala Leu
  1               5                  10                  15

Val Ala Gly Pro Ala Ala Ser Tyr Ala Ala Asp Ala Gly Tyr Thr Pro
             20                  25                  30

Ala Ala Ala Ala Thr Pro Ala Thr Pro Ala Ala Thr Pro Ala Ala Ala
         35                  40                  45

Gly Gly Lys Ala Thr Thr Asp Glu Gln Lys Leu Leu Glu Asp Val Asn
     50                  55                  60

Ala Gly Phe Lys Ala Ala Val Ala Ala Ala Ala Asn Ala Pro Pro Ala
 65                  70                  75                  80

Asp Lys Phe Lys Ile Phe Glu Ala Ala Phe Ser Glu Ser Ser Lys Gly
                 85                  90                  95

Leu Leu Ala Thr Ser Ala Ala Lys Ala Pro Gly Leu Ile Pro Lys Leu
            100                 105                 110

Asp Thr Ala Tyr Asp Val Ala Tyr Lys Ala Ala Glu Gly Ala Thr Pro
        115                 120                 125

Glu Ala Lys Tyr Asp Ala Phe Val Thr Ala Leu Thr Glu Ala Leu Arg
    130                 135                 140

Val Ile Ala Gly Ala Leu Glu Val His Ala Val Lys Pro Ala Thr Glu
145                 150                 155                 160

Glu Val Pro Ala Ala Lys Ile Pro Thr Gly Glu Leu Gln Ile Val Asp
                165                 170                 175

Lys Ile Asp Ala Ala Phe Lys Ile Ala Ala Thr Ala Ala Asn Ala Ala
            180                 185                 190

Pro Thr Asn Asp Lys Phe Thr Val Phe Glu Ser Ala Phe Asn Lys Ala
        195                 200                 205

Leu Asn Glu Cys Thr Gly Gly Ala Tyr Glu Thr Tyr Lys Phe Ile Pro
    210                 215                 220

Ser Leu Glu Ala Ala Val Lys Gln Ala Tyr Ala Ala Thr Val Ala Ala
225                 230                 235                 240

Ala Pro Glu Val Lys Tyr Ala Val Phe Glu Ala Ala Leu Thr Lys Ala
```

245 250 255

Ile Thr Ala Met Thr Gln Ala Gln Lys Ala Gly Lys Pro Ala Ala Ala
260 265 270

Ala Ala Thr Gly Ala Ala Thr Val Ala Thr Gly Ala Ala Thr Ala Ala
275 280 285

Ala Gly Ala Ala Thr Ala Ala Ala Gly Gly Tyr Lys Ala
290 295 300

<210> 3
<211> 20
<212> PRT
<213> Escherichia coli

<220>
<223> all occurrences of Xaa=hydroxyproline

<400> 3
Ala Asp Ala Gly Tyr Thr Xaa Ala Ala Ala Ala Thr Xaa Ala Thr Xaa
1 5 10 15

Ala Ala Thr Xaa
20

<210> 4
<211> 20
<212> PRT
<213> Escherichia coli

<220>
<223> all occurrences of Xaa=hydroxyproline

<400> 4
Ala Thr Xaa Ala Thr Pro Ala Ala Thr Xaa Ala Ala Ala Gly Gly Lys
1 5 10 15

Ala Thr Thr Asp
20

<210> 5
<211> 20
<212> PRT
<213> Escherichia coli

<220>
<223> all occurrences of Xaa =hydroxyproline

<400> 5
Ala Ala Ala Gly Gly Lys Ala Thr Thr Asp Glu Gln Lys Leu Leu Glu
1 5 10 15

Asp Val Asn Ala

20

<210> 6
<211> 20
<212> PRT
<213> Escherichia coli

<400> 6
Glu Gln Lys Leu Leu Glu Asp Val Asn Ala Gly Phe Lys Ala Ala Val
1 5 10 15

Ala Ala Ala Ala
20

<210> 7
<211> 16
<212> PRT
<213> Escherichia coli

<400> 7
Gly Phe Lys Ala Ala Val Ala Ala Ala Ala Asn Ala Pro Pro Ala Asp
1 5 10 15

<210> 8
<211> 20
<212> PRT
<213> Escherichia coli

<400> 8
Asn Ala Pro Pro Ala Asp Lys Phe Lys Ile Phe Glu Ala Ala Phe Ser
1 5 10 15

Glu Ser Ser Lys
20

<210> 9
<211> 20
<212> PRT
<213> Escherichia coli

<400> 9
Phe Glu Ala Ala Phe Ser Glu Ser Ser Lys Gly Leu Leu Ala Thr Ser
1 5 10 15

Ala Ala Lys Ala
20

<210> 10
<211> 20
<212> PRT
<213> Escherichia coli

<400> 10
Gly Leu Leu Ala Thr Ser Ala Ala Lys Ala Pro Gly Leu Ile Pro Lys
1 5 10 15

Leu Asp Thr Ala
20

<210> 11
<211> 20
<212> PRT
<213> Escherichia coli

<400> 11
Pro Gly Leu Ile Pro Lys Leu Asp Thr Ala Tyr Asp Val Ala Tyr Lys
1 5 10 15

Ala Ala Glu Gly
20

<210> 12
<211> 20
<212> PRT
<213> Escherichia coli

<400> 12
Tyr Asp Val Ala Tyr Lys Ala Ala Glu Gly Ala Thr Pro Glu Ala Lys
1 5 10 15

Tyr Asp Ala Phe
20

<210> 13
<211> 20
<212> PRT
<213> Escherichia coli

<400> 13
Ala Thr Pro Glu Ala Lys Tyr Asp Ala Phe Val Thr Ala Leu Thr Glu
1 5 10 15

Ala Leu Arg Val
20

<210> 14
<211> 20
<212> PRT
<213> Escherichia coli

<400> 14
Val Thr Ala Leu Thr Glu Ala Leu Arg Val Ile Ala Gly Ala Leu Glu
1 5 10 15

Val His Ala Val

20

<210> 15
<211> 20
<212> PRT
<213> Escherichia coli

<400> 15
Ile Ala Gly Ala Leu Glu Val His Ala Val Lys Pro Ala Thr Glu Glu
1 5 10 15

Val Pro Ala Ala
20

<210> 16
<211> 20
<212> PRT
<213> Escherichia coli

<400> 16
Lys Pro Ala Thr Glu Glu Val Pro Ala Ala Lys Ile Pro Thr Gly Glu
1 5 10 15

Leu Gln Ile Val
20

<210> 17
<211> 20
<212> PRT
<213> Escherichia coli

<400> 17
Lys Ile Pro Thr Gly Glu Leu Gln Ile Val Asp Lys Ile Asp Ala Ala
1 5 10 15

Phe Lys Ile Ala
20

<210> 18
<211> 20
<212> PRT
<213> Escherichia coli

<400> 18
Asp Lys Ile Asp Ala Ala Phe Lys Ile Ala Ala Thr Ala Ala Asn Ala
1 5 10 15

Ala Pro Thr Asn
20

<210> 19
<211> 20

<212> PRT
<213> Escherichia coli

<400> 19
Ala Thr Ala Ala Asn Ala Ala Pro Thr Asn Asp Lys Phe Thr Val Phe
1 5 10 15

Glu Ser Ala Phe
20

<210> 20
<211> 20
<212> PRT
<213> Escherichia coli

<400> 20
Asp Lys Phe Thr Val Phe Glu Ser Ala Phe Asn Lys Ala Leu Asn Glu
1 5 10 15

Cys Thr Gly Gly
20

<210> 21
<211> 20
<212> PRT
<213> Escherichia coli

<400> 21
Asn Lys Ala Leu Asn Glu Cys Thr Gly Gly Ala Tyr Glu Thr Tyr Lys
1 5 10 15

Phe Ile Pro Ser
20

<210> 22
<211> 20
<212> PRT
<213> Escherichia coli

<400> 22
Ala Tyr Glu Thr Tyr Lys Phe Ile Pro Ser Leu Glu Ala Ala Val Lys
1 5 10 15

Gln Ala Tyr Ala
20

<210> 23
<211> 20
<212> PRT
<213> Escherichia coli

<400> 23
Leu Glu Ala Ala Val Lys Gln Ala Tyr Ala Ala Thr Val Ala Ala Ala

1 5 10 15

Pro Glu Val Lys
20

<210> 24
<211> 20
<212> PRT
<213> Escherichia coli

<400> 24
Ala Thr Val Ala Ala Ala Pro Glu Val Lys Tyr Ala Val Phe Glu Ala
1 5 10 15

Ala Leu Thr Lys
20

<210> 25
<211> 20
<212> PRT
<213> Escherichia coli

<400> 25
Tyr Ala Val Phe Glu Ala Ala Leu Thr Lys Ala Ile Thr Ala Met Thr
1 5 10 15

Gln Ala Gln Lys
20

<210> 26
<211> 20
<212> PRT
<213> Escherichia coli

<400> 26
Ala Ile Thr Ala Met Thr Gln Ala Gln Lys Ala Gly Lys Pro Ala Ala
1 5 10 15

Ala Ala Ala Thr
20

<210> 27
<211> 20
<212> PRT
<213> Escherichia coli

<400> 27
Ala Gly Lys Pro Ala Ala Ala Ala Ala Thr Gly Ala Ala Thr Val Ala
1 5 10 15

Thr Gly Ala Ala
20

<210> 28
<211> 20
<212> PRT
<213> Escherichia coli

<400> 28
Gly Ala Ala Thr Val Ala Thr Gly Ala Ala Thr Ala Ala Ala Gly Ala
1 5 10 15

Ala Thr Ala Ala
20

<210> 29
<211> 16
<212> PRT
<213> Escherichia coli

<400> 29
Thr Ala Ala Ala Gly Ala Ala Thr Ala Ala Ala Gly Gly Tyr Lys Ala
1 5 10 15

<210> 30
<211> 20
<212> PRT
<213> Escherichia coli

<400> 30
Ile Ala Lys Val Pro Pro Gly Pro Asn Ile Thr Ala Glu Tyr Gly Asp
1 5 10 15

Lys Trp Leu Asp
20

<210> 31
<211> 20
<212> PRT
<213> Escherichia coli

<400> 31
Ile Ala Lys Val Xaa Pro Gly Xaa Asn Ile Thr Ala Glu Tyr Gly Asp
1 5 10 15

Lys Trp Leu Asp
20

<210> 32
<211> 20
<212> PRT
<213> Escherichia coli

<400> 32
Thr Ala Glu Tyr Gly Asp Lys Trp Leu Asp Ala Lys Ser Thr Trp Tyr

1 5 10 15

Gly Lys Pro Thr
20

<210> 33
<211> 20
<212> PRT
<213> Escherichia coli

<400> 33
Gly Ala Gly Pro Lys Asp Asn Gly Gly Ala Cys Gly Tyr Lys Asn Val
1 5 10 15

Asp Lys Ala Pro
20

<210> 34
<211> 20
<212> PRT
<213> Escherichia coli

<400> 34
Gly Ala Gly Pro Lys Asp Asn Gly Gly Ala Cys Gly Tyr Lys Asp Val
1 5 10 15

Asp Lys Ala Pro
20

<210> 35
<211> 20
<212> PRT
<213> Escherichia coli

<400> 35
Cys Gly Tyr Lys Asp Val Asp Lys Ala Pro Phe Asn Gly Met Thr Gly
1 5 10 15

Cys Gly Asn Thr
20

<210> 36
<211> 22
<212> PRT
<213> Escherichia coli

<400> 36
Cys Gly Phe Asn Gly Met Thr Gly Cys Gly Asn Thr Pro Ile Phe Lys
1 5 10 15

Asp Gly Arg Gly Cys Gly
20

<210> 37
<211> 20
<212> PRT
<213> Escherichia coli

<400> 37
Pro Ile Phe Lys Asp Gly Arg Gly Cys Gly Ser Cys Phe Glu Ile Lys
1 5 10 15

Cys Thr Lys Pro
20

<210> 38
<211> 20
<212> PRT
<213> Escherichia coli

<400> 38
Ser Cys Phe Glu Ile Lys Cys Thr Lys Pro Glu Ser Cys Ser Gly Glu
1 5 10 15

Ala Val Thr Val
20

<210> 39
<211> 20
<212> PRT
<213> Escherichia coli

<400> 39
Glu Ser Cys Ser Gly Glu Ala Val Thr Val Thr Ile Thr Asp Asp Asn
1 5 10 15

Glu Glu Pro Ile
20

<210> 40
<211> 20
<212> PRT
<213> Escherichia coli

<400> 40
Thr Ile Thr Asp Asp Asn Glu Glu Pro Ile Ala Pro Tyr His Phe Asp
1 5 10 15

Leu Ser Gly His
20

<210> 41
<211> 20
<212> PRT
<213> Escherichia coli

<400> 41
Ala Pro Tyr His Phe Asp Leu Ser Gly His Ala Phe Gly Ser Met Ala
1 5 10 15

Asp Asp Gly Glu
20

<210> 42
<211> 20
<212> PRT
<213> Escherichia coli

<400> 42
Ala Phe Gly Ser Met Ala Asp Asp Gly Glu Glu Gln Lys Leu Arg Ser
1 5 10 15

Ala Gly Glu Leu
20

<210> 43
<211> 20
<212> PRT
<213> Escherichia coli

<400> 43
Glu Gln Lys Leu Arg Ser Ala Gly Glu Leu Glu Leu Gln Phe Arg Arg
1 5 10 15

Val Lys Cys Lys
20

<210> 44
<211> 20
<212> PRT
<213> Escherichia coli

<400> 44
Glu Leu Gln Phe Arg Arg Val Lys Cys Lys Tyr Pro Asp Asp Thr Lys
1 5 10 15

Pro Thr Phe His
20

<210> 45
<211> 20
<212> PRT
<213> Escherichia coli

<400> 45
Tyr Pro Asp Asp Thr Lys Pro Thr Phe His Val Glu Lys Ala Ser Asn
1 5 10 15

Pro Asn Tyr Leu
20

<210> 46
<211> 20
<212> PRT
<213> Escherichia coli

<400> 46
Val Glu Lys Ala Ser Asn Pro Asn Tyr Leu Ala Ile Leu Val Lys Tyr
1 5 10 15

Val Asp Gly Asp
20

<210> 47
<211> 20
<212> PRT
<213> Escherichia coli

<400> 47
Val Glu Lys Gly Ser Asn Pro Asn Tyr Leu Ala Ile Leu Val Lys Tyr
1 5 10 15

Val Asp Gly Asp
20

<210> 48
<211> 20
<212> PRT
<213> Escherichia coli

<400> 48
Ala Ile Leu Val Lys Tyr Val Asp Gly Asp Gly Asp Val Val Ala Val
1 5 10 15

Asp Ile Lys Glu
20

<210> 49
<211> 20
<212> PRT
<213> Escherichia coli

<400> 49
Gly Asp Val Val Ala Val Asp Ile Lys Glu Lys Gly Lys Asp Lys Trp
1 5 10 15

Ile Glu Leu Lys
20

<210> 50

<211> 20
<212> PRT
<213> Escherichia coli

<400> 50
Lys Gly Lys Asp Lys Trp Ile Glu Leu Lys Glu Ser Trp Gly Ala Val
1 5 10 15

Trp Arg Ile Asp
20

<210> 51
<211> 20
<212> PRT
<213> Escherichia coli

<400> 51
Thr Pro Asp Lys Leu Thr Gly Pro Phe Thr Val Arg Tyr Thr Thr Glu
1 5 10 15

Gly Gly Thr Lys
20

<210> 52
<211> 20
<212> PRT
<213> Escherichia coli

<400> 52
Val Arg Tyr Thr Thr Glu Gly Gly Thr Lys Ser Glu Val Glu Asp Val
1 5 10 15

Ile Pro Glu Gly
20

<210> 53
<211> 20
<212> PRT
<213> Escherichia coli

<400> 53
Ser Glu Val Glu Asp Val Ile Pro Glu Gly Trp Lys Ala Asp Thr Ser
1 5 10 15

Tyr Ser Ala Lys
20

<210> 54
<211> 33
<212> PRT
<213> Escherichia coli

<220>

<223> all occurrences of Xaa=hydroxyproline

<400> 54
Ala Asp Ala Gly Tyr Thr Xaa Ala Ala Ala Ala Thr Xaa Ala Thr Xaa
1 5 10 15

Ala Ala Thr Xaa Ala Ala Ala Gly Gly Lys Ala Thr Thr Asp Glu Gln
20 25 30

Lys

<210> 55
<211> 20
<212> PRT
<213> Escherichia coli

<400> 55
Ala Lys Ser Thr Trp Tyr Gly Lys Pro Thr Gly Ala Gly Pro Lys Asp
1 5 10 15

Asn Gly Gly Ala
20

<210> 56
<211> 20
<212> PRT
<213> Escherichia coli

<400> 56
Glu Ser Trp Gly Ala Val Trp Arg Ile Asp Thr Pro Asp Lys Leu Thr
1 5 10 15

Gly Pro Phe Thr
20

<210> 57
<211> 1181
<212> DNA
<213> Escherichia coli

<220>
<221> CDS
<222> (53)..(961)

<220>
<221> mat_peptide
<222> (125)

<400> 57
gaattcgagg atccgggtac catggctccg acaaaccaac gcaagagcag ca atg gca 58
Met Ala

gtg cag cag tac acg gtg gcg ctg ttc ctg gcc gtg gcc tcg tgt cgg 106

```
Val Gln Gln Tyr Thr Val Ala Leu Phe Leu Ala Val Ala Ser Cys Arg
        -20                 -15                 -10

gcc cgc gcc tcc tac gcc gcc gac gcc ggc tac gcc ccc gcc act ccc   154
Ala Arg Ala Ser Tyr Ala Ala Asp Ala Gly Tyr Ala Pro Ala Thr Pro
     -5              -1   1                5                  10

gcc acc ccg gct acc ccc gcg gcc cca ggc gca gcg gtg cca gca ggg   202
Ala Thr Pro Ala Thr Pro Ala Ala Pro Gly Ala Ala Val Pro Ala Gly
                15                  20                  25

aag gcg gcg acc gag gag cag aag ctg atc gag aag atc aac gcc ggc   250
Lys Ala Ala Thr Glu Glu Gln Lys Leu Ile Glu Lys Ile Asn Ala Gly
            30                  35                  40

ttc aag gcc gcc gtg gcg gcc gcc gcg ggc gtc ccg cca ggc gac aag   298
Phe Lys Ala Ala Val Ala Ala Ala Ala Gly Val Pro Pro Gly Asp Lys
         45                  50                  55

tac aag acg ttc gtc gaa acc ttc ggc aag gcc tcc aac aag gcc ttc   346
Tyr Lys Thr Phe Val Glu Thr Phe Gly Lys Ala Ser Asn Lys Ala Phe
     60                  65                  70

ctg ggg gac ctc ccg acc aac tac gcc gat gtc aac tcc agg gcc cag   394
Leu Gly Asp Leu Pro Thr Asn Tyr Ala Asp Val Asn Ser Arg Ala Gln
 75                  80                  85                  90

ctc acc tcg aag ctc gac gcc gcc tac aag ctc gcc tac gac gcc gcc   442
Leu Thr Ser Lys Leu Asp Ala Ala Tyr Lys Leu Ala Tyr Asp Ala Ala
                95                 100                 105

cag ggc gcc acc ccc gag gcc aag tac gac gcc tac gtc gcc acc ctc   490
Gln Gly Ala Thr Pro Glu Ala Lys Tyr Asp Ala Tyr Val Ala Thr Leu
            110                 115                 120

agc gag gcg ctc cgc atc atc gcc ggc acc ctc gag gtc cac gcc gtc   538
Ser Glu Ala Leu Arg Ile Ile Ala Gly Thr Leu Glu Val His Ala Val
        125                 130                 135

aag ccc gct gcc gag gag gtc aag cct atc ccc gcc gga gag ctg cag   586
Lys Pro Ala Ala Glu Glu Val Lys Pro Ile Pro Ala Gly Glu Leu Gln
    140                 145                 150

atc gtc gac aag att gac gtc gcc ttc aga act gcc gcc acc gcc gcc   634
Ile Val Asp Lys Ile Asp Val Ala Phe Arg Thr Ala Ala Thr Ala Ala
155                 160                 165                 170

aac gcc gcc ccc acc aac gac aag ttc acc gta ttc gag acc acc ttt   682
Asn Ala Ala Pro Thr Asn Asp Lys Phe Thr Val Phe Glu Thr Thr Phe
                175                 180                 185

aac aag gcc atc aag gag agc acg ggc ggc acc tac gag agc tac aag   730
Asn Lys Ala Ile Lys Glu Ser Thr Gly Gly Thr Tyr Glu Ser Tyr Lys
            190                 195                 200

ttc att ccc acc ctt gag gcc gcc gtt aag cag gcc tac gcc gcc acc   778
Phe Ile Pro Thr Leu Glu Ala Ala Val Lys Gln Ala Tyr Ala Ala Thr
```

```
        205                 210                 215

gtc gca tcc gcg ccg gag gtc aag tac gcc gtc ttt gag acc gcg ctg   826
Val Ala Ser Ala Pro Glu Val Lys Tyr Ala Val Phe Glu Thr Ala Leu
    220                 225                 230

aaa aag gcg gtc acc gcc atg tcc gag gcc cag aag gaa gcc aag ccc   874
Lys Lys Ala Val Thr Ala Met Ser Glu Ala Gln Lys Glu Ala Lys Pro
235                 240                 245                 250

gcc acc gcc acc ccg acc ccc acc gca act gcc gcg gcc gcg gtg gcc   922
Ala Thr Ala Thr Pro Thr Pro Thr Ala Thr Ala Ala Ala Ala Val Ala
                255                 260                 265

acc aac gcc gcc ccc gtc gct gct ggt ggc tac aaa atc tgatcaactc    971
Thr Asn Ala Ala Pro Val Ala Ala Gly Gly Tyr Lys Ile
            270                 275

gctagcaata tacacatcca tcatgcacat atagagctgt gtatgtatgt gcatgcatgc 1031

cgtggcgccg cgcaagtttg ctcataatta attcttggtt ttcgttgctt gcatccacga 1091

gcgaccgagc ccgtggatag tcgcatgtgt atgtaatttt ttctgagaaa tgtgtatatg 1151

taatatataa ttgagtacta aaaaaaaaaa                                   1181


<210> 58
<211> 303
<212> PRT
<213> Escherichia coli

<400> 58
Met Ala Val Gln Gln Tyr Thr Val Ala Leu Phe Leu Ala Val Ala Ser
                -20                 -15                 -10

Cys Arg Ala Arg Ala Ser Tyr Ala Ala Asp Ala Gly Tyr Ala Pro Ala
            -5                  -1   1                  5

Thr Pro Ala Thr Pro Ala Thr Pro Ala Ala Pro Gly Ala Ala Val Pro
     10                  15                  20

Ala Gly Lys Ala Ala Thr Glu Glu Gln Lys Leu Ile Glu Lys Ile Asn
 25                  30                  35                  40

Ala Gly Phe Lys Ala Ala Val Ala Ala Ala Ala Gly Val Pro Pro Gly
                45                  50                  55

Asp Lys Tyr Lys Thr Phe Val Glu Thr Phe Gly Lys Ala Ser Asn Lys
            60                  65                  70

Ala Phe Leu Gly Asp Leu Pro Thr Asn Tyr Ala Asp Val Asn Ser Arg
         75                  80                  85

Ala Gln Leu Thr Ser Lys Leu Asp Ala Ala Tyr Lys Leu Ala Tyr Asp
     90                  95                  100
```

```
Ala Ala Gln Gly Ala Thr Pro Glu Ala Lys Tyr Asp Ala Tyr Val Ala
105                 110                 115                 120

Thr Leu Ser Glu Ala Leu Arg Ile Ile Ala Gly Thr Leu Glu Val His
                125                 130                 135

Ala Val Lys Pro Ala Ala Glu Glu Val Lys Pro Ile Pro Ala Gly Glu
            140                 145                 150

Leu Gln Ile Val Asp Lys Ile Asp Val Ala Phe Arg Thr Ala Ala Thr
        155                 160                 165

Ala Ala Asn Ala Ala Pro Thr Asn Asp Lys Phe Thr Val Phe Glu Thr
    170                 175                 180

Thr Phe Asn Lys Ala Ile Lys Glu Ser Thr Gly Gly Thr Tyr Glu Ser
185                 190                 195                 200

Tyr Lys Phe Ile Pro Thr Leu Glu Ala Ala Val Lys Gln Ala Tyr Ala
                205                 210                 215

Ala Thr Val Ala Ser Ala Pro Glu Val Lys Tyr Ala Val Phe Glu Thr
            220                 225                 230

Ala Leu Lys Lys Ala Val Thr Ala Met Ser Glu Ala Gln Lys Glu Ala
        235                 240                 245

Lys Pro Ala Thr Ala Thr Pro Thr Pro Thr Ala Thr Ala Ala Ala Ala
    250                 255                 260

Val Ala Thr Asn Ala Ala Pro Val Ala Ala Gly Gly Tyr Lys Ile
265                 270                 275


<210> 59
<211> 20
<212> PRT
<213> Escherichia coli

<220>
<223> all occurrences of Xaa=hydroxyproline

<400> 59
Ala Asp Ala Gly Tyr Thr Xaa Ala Ala Ala Ala Thr Xaa Ala Thr Xaa
  1               5                  10                  15

Ala Ala Thr Xaa
             20


<210> 60
<211> 20
<212> PRT
<213> Escherichia coli

<220>
<223> all occurrences of Xaa=hydroxyproline
```

<400> 60
Ala Thr Xaa Ala Thr Xaa Ala Ala Thr Xaa Ala Ala Ala Gly Gly Lys
1 5 10 15

Ala Thr Thr Asp
20